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ABSTRACT

This paper is a critical examination of Piaget's formulations on cognitive development based on recent social learning research. It is suggested that learning to conserve does not seem immutably dependent on the child's attaining some maturational age-related cognitive stage and that Piaget's theorizations do not sufficiently consider social variables influencing thought. Study findings reported here support the contention that attempts to characterize children's thinking on the basis of any formal logic model which does not consider social factors will not afford optimal prediction of children's conceptual response. (CS)

PIAGET'S FORMULATIONS ON COGNITIVE DEVELOPMENT: A CRITICAL EXAMINATION IN LIGHT OF RECENT SOCIAL LEARNING RESEARCH

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Recently several research studies have been conducted which demonstrated that modeling procedures have been effective in teaching children to conserve precociously. In an initial series of experiments, Rosenthal and Zimmerman (1972) found that four- to six-year-old children could acquire and transfer multi-dimensional conservation response through observation. In a second experiment in this series, children who initially conserved during baseline testing, were exposed to an adult model who exhibited non-conservation responses. A significant reduction in number of conserving judgments was found with these children during both acquisition and generalization phases. In a third experiment, observing a model was greatly superior to providing equivalent information through instructions alone in teaching bilingual disadvantaged children to conserve. In a final experiment, four-year-olds were exposed to a conserving adult model to determine whether children this young could profit from vicarious training. A special alternation procedure in which the model and child responded in turn on each item was effective in creating initative

conservation, a skill which transferred to unfamiliar generalization items. This series of studies revealed that observational learning procedures were effective in modifying conservation response. Recently, we have completed two additional studies, one of which is already in press. In these studies both four- and five-year-old children vicariously acquired, transferred, and retained a conservation rule. Zimmerman and Lanaro (1973) found that four-year-olds could transfer a conservation rule learned on length items to two dimensional space items. Zimmerman and Rosenthal (in press) found that children who had been trained to conserve could "spontaneously" justify their new learning nonverbally according to a qualitatively different logical rule from that used by the model.

Thus there is evidence that children as young as four years of age who displayed practically no evidence of being able to conserve did show significant acquisition and retention according to either judgments only or the judgments plus rule conservation criteria. Piagetians have responded to this research by questioning whether these children really "learned" to conserve. Such a query often implies non-operational criteria for judging conservation response and to that degree can never be answered wholly satisfactorially. However, evidence from a variety of sources suggest that a generalized rule for responding to phenomena on the basis of quantitative properties versus perceived properties was learned, adopted and retained by the children studied.

Critics of this modeling research have argued that these results do not necessarily reflect "true" conservation because several alternative

explanations for these findings are tenable. These alternative hypotheses can be grouped in four general categories: children who were considered to have learned to conserve instead (1) had acquired only a simple rote response set "same" to conservation phenomena, (2) were acquiescing to momentary social influences but did not alter their method of cognizing conservation pehnomena in any relatively permanent fashion, (3) were simply minicking the model's choices and did not acquire a transferable rule, (4) did not really believe the conservation rule to be true or accept it themselves even though they could respond according to the rule. Let me briefly relate some of the evidence available bearing on these alternative explanations.

The question of a simple rote response set of "same" arose because of the procedures we employed in our first conservation study (Rosenthal & Zimmerman, 1972). Due to design considerations which resulted from our use of the Goldschmid and Bentler (1968) test of multi-dimensional conservation, the model's conservation response always required a judgment of stimulus equality (or a judgment plus rule) because only equal stimulus members were presented and transformed. It was suggested that the child simply learned to emit "same" judgments when confronted by conservation phenomena. However, in subsequent research which was conducted using both equal and unequal stimuli, significant acquisition and retention were found with both types of stimuli (Zimmerman & Lanaro, 1973; Zimmerman & Rosenthal, in press). Clearly these data contradict any explanations for modeling results based on a general response set. These children necessarily had to discriminate the comparability of the stimuli prior

to transformation and appropriately respond in one of two different ways after the stimuli were transformed.

With regard to the question raised concerning the relative permanency of vicariously-induced conservation response, significant retention of conservation response was noted in each of two studies after a seven to ten day delay. These studies were conducted with both four- and five-year-old children and employed both equality and inequality conservation items. Since the items used during retention testing were never used during training, simple recall of prior discrete responses could not account for these results. These data support the interpretation that modeling procedures were not simply exerting momentary social influences, but rather were effective in providing the children with a relatively permanent conceptual rule that could be used to cognize conservation phenomena.

We had one tenacious critic who maintained that even if the child could differentially respond to equality and inequality items, could generalize this rule to new stimuli, and could retain it over time, the child was merely yielding to the social demands of the situation and did not really adopt the conservation criteria for himself. He reasoned that since the same experimenter and model were present during all phases of these studies, that the child might have been "playing along." Thus this critic appeared to acknowledge that the child could learn a conservation rule even to the point of differentially responding to equality and inequality items, and yet might not believe the veracity of the rule. While we have controlled such experimenter demand effects in research

conducted with older third grade children on a different concept formation task (Zimmerman & Rosenthal, 1972), we have not definitively tested this hypothesis with young children on a conservation task. However, there are a variety of data which suggest that the children did in fact accept the conservation rule as being accurate. For example, in our initial study, we found that six-year-old children who witnessed a model make judgments without offering a rule for her choice, significantly increased their provision of a viable conservation rule over baseline and over control group response. The fact that the child could appropriately justify the model's choices suggested that the model's behavior was not viewed as being arbitrary or capricious, but instead as a source of information which could be supported by and was consistent with other information or experiences available to the child. Secondly, in another experiment, initially conserving six-year-olds were exposed to a model who gave non-conserving judgments but did not verbally justify these responses. The children in this study not only significantly decreased their number of conserving judgments below baseline levels, but they also reduced the number of reasons below baseline frequencies. It was anecdotally observed that the children substituted non-conserving reasons to justify their non-conserving judgments. In both instances, if the children were simply mimicking the model in response to social demand pressures and not "internalizing" the rule, it would seem unlikely that they could generate plausible reasons for the model's behavior which covaried upward and downward respectively, with the import of the model's judgments. It appears from these data and our anecdotal observation of these children,

that these youngsters did in fact adopt this rule. However, this does not imply that subsequent experiences could not attenuate or cancel these effects. This issue will be treated later.

Most evidence collected to date rules out a mimicry interpretation for these data. There is a rather substantial body of research which indicates that even children as young as three can vicariously acquire general rules (Zimmerman & Rosenthal, in press). The transfer findings reported in these studies are consistent with the interpretation that generalized conservation rule had been acquired. In all studies, we have found that the conservation skill generalizes to different item instances within the same classes studied. For example, Rosenthal and Zimmerman (1972) trained the children on the following subclasses of conservation: number, substance, weight, two dimensional space, continuous and discontinuous quantity. Generalization was noted to other items drawn from these dimensions. We have found very little evidence of differential response by children to the model's demonstration on each subtype of conservation. In subsequent research, (Zimmerman & Rosenthal, in press) we statistically analyzed acquisition of each of three subclasses of conservation (length, number and space) displayed by the model, significant acquisition for each subclass was noted and the amounts of acquisition of each type of conservation were highly intercorrelated. In addition, we found generalization of conservation responding from a verbal to a nonverbal response mode. In this study, the children in training groups were exposed to a model who used an invariant quantity explanation to justify his conservation judgments. After training, the children who learned to conserve on length items were asked how they

would show a friend the accuracy of their judgments. These children displayed significantly higher incidence of nonverbal reversibility responses than untrained children. It should be pointed out that Piagetians classify invariant quantity and reversibility explanations as qualitatively different types of response. In addition, Zimmerman & Lanaro (1973) demonstrated a significant degree of cross conservation class transfer in making judgments (from length to two dimensional space). This cross-class transfer is the criterion most often preferred by Piagetians and on this theoretical issue that Piagetians and social learning theoretical accounts appear to diverge most sharply.

A social learning position tends to view generalization from a very different perspective from that of Piaget. A Piagetian position appears to treat generalization as a product of logical structures of the intellect which are relatively independent of the stimulus or associative characteristics of the task. Thus, a child who conserves length under a Muller-Lyer illusion is also expected to conserve with two equal lengths of rope, tied to two tree limbs of differing heights; if a child fails to conserve in both instances, he is classified as a nonconserver or to be "in transition."

In contrast, a social learning position tends to view generalization in terms of stimulus characteristics, prior existing stimulus and response associations which have been developed through either direct or vicarious experiences, and the organization and variability of stimuli encountered during training experiences. This position does not suggest that a person can only generalize learning experiences to phenomena to

which he had particular experience. On the contrary, generalization is theorized to be a product of pre-existing category groups, even if such categories are implicit and incapable of being easily verbalized. For example, if a child's notion of "animals" includes barn yard animals and excludes wild animals such as found in a zoo, then conceptual rules which are learned with barn yard animals are not expected to generalize to zoo animals. It is suggested that a person brings to each learning situation a variety of nested and overlapping categories similar to those described by Mandler (1967). To the degree that a particular training experience presents the conceptual rule in a variety of environmental settings, the more likely is the rule to be associated with a diversity of categorical groupings and hence the greater degree of expected generalization.

Obviously a young child's prior categories are going to contain fewer submembers than those of an adult, and hence generalization of a rule learning experience will be restricted to members of that category set. As the child becomes older, his conceptual categories will contain more submembers and there is greater degree of cross referencing of members between qualitatively different concepts (vide Staats, 1961), and generalization can be expected to improve. But just because a child's ability to generalize learned experience is more restricted than that of an adult, it does not mean he is incapable of logical thought. Adults will greatly vary in their ability to generalize from a common experience for the same reasons.

Thus, a social learning position would only expect generalization of the conservation rule to the general domain of stimuli and events that

were sampled in the construction of the training task or covertly related to these stimuli. This position requires some knowledge of the content and varigation of a child's conceptual categories to predict the extent of rule transfer. It appears quite conceivable that younger children might require a larger "sample" of training experiences to generalize a conceptual rule to a particular associative grouping. However, this position greatly differs from that of Piagetians who usually claim that trained conservation responses are not real because they do not extend to all phenomena that an adult would consider appropriate. Two of these studies clearly indicated that even children as young as four years old can learn conservation rules which generalize to the population of phenomena sampled in the training experience. Further, it was demonstrated that such learning was maintained over a reasonably long delay period. While such rule learning may not be as dramatic in its generalizability as that witnessed with older children, it nonetheless is not exclusively restricted to training stimuli and is stable across time.

Considering the results of these studies, it is suggested that learning to conserve does not seem immutably dependent on the child's attaining some maturational, age-related cognitive stage. This is not to say that a child's age is an unimportant factor in instruction but simply to question the need for making assumptions about a child's "cognitive readiness." Consider the pedagogical implications of such a postulate. In pilot testing for the Zimmerman and Lanaro (1973) study, it was found that children could not imitate the model's judgments and reasoning if both were presented in a single episode. This inability

could have been attributed to the children's preoperational intellectual structure. However, when the task was subdivided into separate judgment and reasoning components, the children were able to imitate effectively and to spontaneously recombine both responses during later testing (which was conducted without subdivision). Thus, while the age of the child was an important factor in determining the form of instruction, it did not control the cognitive content. Both Bruner (1966) and Rohwer (1972) have made similar observations with regard to mathematics and paired associate learning respectively. To quote Bruner (1966, p.29), "One teaches readiness or provides opportunities for its nurturance, one does not simply wait for it."

The position advanced here doesn't discount the importance of developmental factors in influencing children's response, nor does it contest Piaget's observations of children's conceptual behavior. It does, however, argue against discrete stage theories of development and maintains that children as young as four years can learn abstract conceptual rules which can be generalized and retained over time. It is suggested that children are raised in a social context which exemplifies and sanctions rule-consistent response to delimited categories of phenomena. Piaget, like others advocating a developmental position, has not given much attention to social variables influencing thought. To be sure, he has advocated that experience has some role in children's intellectual functioning, however it is largely left undifferentiated except to the degree that a child's age reflects his experiences. He has also attempted to describe (usually post hoc) some conceptual responding in terms of

his amorphous equilibrium analogy. But the substance of Piaget's theorizations are not qualified by any social context considerations. It is important to point out that much of what is considered "logical" is defined by social convention. B. F. Skinner (1953) recognized the role of social forces in concept formation. He suggested that there are probably no natural contingencies which reinforce abstraction responses. These responses require the active intervention of other human agents. This observation points out that abstraction is inextricably tied to the social setting and that theories attempting to account for children's conceptual response must consider this social context as a central variable. As Festinger (1950) phrased it in his classic discussion of normative social influences on abstract communication: When no unambiguous criteria is given for determining the validity of action, people typically turn to their fellows for guidance and consensus. Any parent who has suffered through a barrage of "whys" and "show mes" from his preschooler will attest to the central role that human agents play in children's thought development.

What is needed is a rapproachment between a developmental model and a purely social learning model. Undoubtedly a child's neural and physical development will influence his ability to profit from social experience. However, evidence adduced here supports the contention that attempts to characterize children's thinking on the basis of any formal logic model which does not consider social factors will not afford optimal prediction of children's conceptual response.

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